PROJECT facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Power Plant Improvement Initiative (PPII)

03/2004

BIG BEND POWER STATION NEURAL NETWORK-SOOTBLOWER OPTIMIZATION

CONTACT

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PARTICIPANT

Tampa Electric Company

LOCATION

Tampa Electric's Big Bend Power Station
Apollo Beach, Hillsborough County, FL

Description

Conversion of coal as an energy source to produce steam for a variety of systems has been a cornerstone of modern industry. However, one particular problem that exists with coal-fired electric generators is the formation and deposition of ash and slag within the boiler. The fouling of the boiler by ash and slag compromises plant efficiency by impeding the transfer of heat to the working fluid (water/steam). Heat remains in the flue-gas and exits to the environment without beneficial use. This loss in efficiency translates to higher consumption of fuel for equivalent levels of electric generation; hence more gaseous emissions are produced.

Another less obvious problem exists relating to the intensity of peak temperatures within and around the boilers combustion zone. As the fouling of the boiler increases and the rate of heat transfer decreases, peak temperatures increase, as does nitrogen oxides (NO_x) production.

Due to the composition of coal, particulate matter is also a by-product of coal combustion. Modern day utility boilers are usually fitted with electrostatic precipitators to aid in the collection of particulate matter (PM). Although extremely efficient, these devices are sensitive to rapid changes in inlet mass concentration as well as total mass loading. Without extreme care and due diligence, excessive soot can overload an ESP resulting in high levels of PM being released.

Traditionally, utility boilers are equipped with devices known as sootblowers that use steam, water, or air to dislodge and clean the surfaces within the boiler and are operated based upon established rules or operators judgment. NO_x and PM emissions and boiler performance are directly affected by the sootblowing practices on a unit.

The intent of this project is to apply a neural network intelligent sootblowing system from Pegasus Technologies, Inc. Mentor, Ohio in conjunction with state-of-the-art controls and instruments to optimize the operation of a utility boiler and systematically control boiler fouling. By utilizing the unique, on-line, adaptive technology at the core of Pegasus Optimization Suite 2003, operation of sootblowers can be dynamically controlled based on real-time events and conditions in the boiler.

Big Bend Power Station Neural Network-Sootblower Optimization

TOTAL PROJECT FUNDING

$2,381,614

COST SHARE

DOE	$ 905,013
Participant	$1,476,601 (62%)

ADDITIONAL TEAM MEMBERS

Pegasus Technology, Inc.
(technology supplier)

ESTIMATED PROJECT DURATION

27 Months

CUSTOMER SERVICE

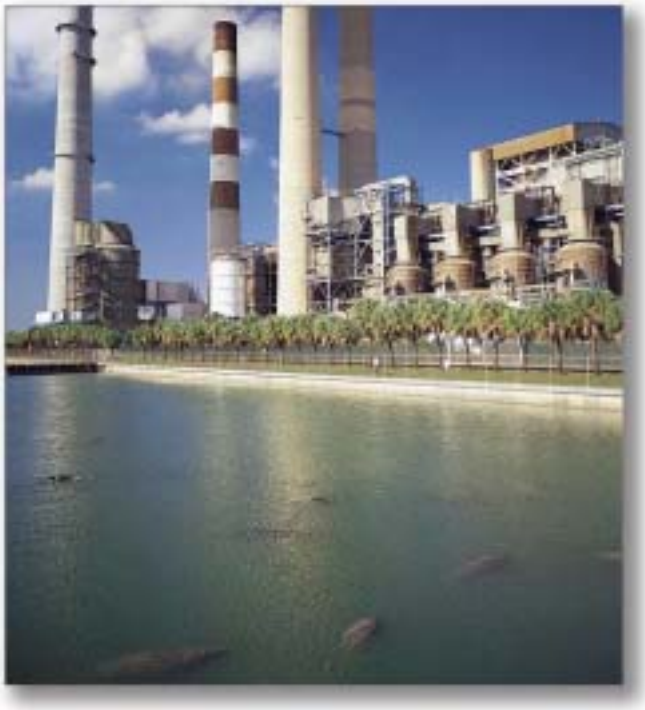
800-553-7681

WEBSITE

www.netl.doe.gov

Benefits

This net impact of this project to the electric utility industry will be the demonstration of a commercially viable Neural Network-Sootblower system that improves overall plant reliability and operations by reducing production costs, while also minimizing emissions. The system is expected to reduce total NO_x production by up to 20-30% or more, improve heat rate as much as 2%, and reduce PM emissions in the range of 5%. As compared to competing technologies, this could be an extremely cost-effective technology, which has the ability to be readily and easily adapted to virtually any pulverized-coal boiler.



Tampa Electric's Big Bend Power Station